FINAL PROJECT

PRELIMINARY PLANT DESIGN OF GYPSUM USING LIMESTONE AND SULFURIC ACID WITH CAPACITY OF 100,000 TONS/YEAR

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THE APPROVAL SHEET

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PRELIMINARY PLANT DESIGN OF GYPSUM USING LIMESTONE AND SULFURIC ACID WITH CAPACITY OF 100,000 TONS/YEAR

Abstract

Gypsum or calcium sulfate dihydrate requirement in Indonesia is fulfilled with domestic production and imported from abroad. Domestic gypsum production is still not sufficient to meet the needs of gypsum in Indonesia. Therefore, imports from foreign countries are still needed. By establishing the gypsum industry in Indonesia, it is expected to meet the needs of gypsum in Indonesia

Gypsum is production from the reaction between limestone ($CaCO_3$) and sulfuric acid solution (H_2SO_4) 50% of weight in Continuous Stirred-Tank Reactor (CSTR)) with the capacity of product 100,000 tons/year in the reactor at the operating conditions of temperature at 93 °C and pressure at 1 atm. Raw material for the plant required are limestone ($CaCO_3$) 7,549 kg/hour and sulfuric acid solution (H_2SO_4) 6,898 kg/hour with the general reaction as follows like below : $CaCO_3$ (s) + H_2SO_4 (l) + H_2O (l) → $CaSO_4.2H_2O$ (s) + CO_2 (g) and the weight ratio between the limestone and sulfuric acid entering the reactor is 1:1 in kilograms. The residence time in the reactor was 10 minutes.

Plant will be build at 2030 in the Indarung,Padang with area is 16,940 m^2 .The result of calculate that Fixed Cost (Fa) is 41,797,168,267. Regulated Cos (Ra) is 505,053,337,480 Cost of raw material (Sa) is 1,358,239,263,511.Variable cost (Va) is 629,447,458,716.get the value of BEP is 51.52% (at range 40% - 60%) and get the value of SDP is 51.52% for POT after tax is 1.8 years (maksimmum 5 years). we get value of Internal Rate of Return (IRR) = 19,35% So if this plant will be build so many advantages and very profitably.

Keywords: Gypsum, calcium sulfate dihydrate, $CaSO_4.2H_2O$

PRARANCANGAN PABRIK GYPSUM DARI BATU KAPUR DAN ASAM SULFAT DENGAN KAPASITAS 100.000 TON / TAHUN

Abstrak

Kebutuhan gipsum di Indonesia dicukupi dengan produksi dalam negeri dan impor dari luar negeri. Produksi gipsum dalam negeri masih belum mencukupi untuk memenuhi kebutuhan gipsum di Indonesia. Oleh karena itu masih diperlukan impor dari luar negeri. Dengan pendirian industri gipsum di Indonesia, diharapkan mampu mencukupi ketubutuhan gipsum di Indonesia

Gypsum diproduksi dari reaksi antara batu kapur (CaCO3) dan larutan asam sulfat (H_2SO_4) 50% berat dalam Continuous Stirred-Tank Reactor (CSTR)) dengan kapasitas produk 100.000 ton / tahun pada kondisi operasi suhu dalam reaktor. Pada suhu 93° C dan tekanan pada 1 atm. Bahan baku untuk pabrik yang dibutuhkan adalah batu kapur (CaCO3) 7,549 kg / jam dan larutan asam sulfat (H_2SO_4) 6,898 kg / jam dengan reaksi umum seperti berikut: CaCO3 (s) + H_2SO_4 (l) + H_2O (l) → $CaSO_4.2H_2O$ (s) + CO_2 (g) dan perbandingan berat antara batu kapur dan asam sulfat yang masuk ke dalam reaktor adalah 1: 1 dalam kilogram. Waktu tinggal di reaktor adalah 10 menit.

Pabrik akan dibangun pada 2030 di Indarung, Padang dengan luas 16.940 m2. Hasil perhitungan Biaya Tetap (Fa) adalah 41.797.168.267. Regulated Cos (Ra) adalah 505.053.337.480 Biaya bahan baku (Sa) adalah 1.358.239.263.511.Variable cost (Va) adalah 629.447.458.716.mendapatkan nilai BEP adalah 51,52% (pada kisaran 40% - 60%) dan mendapatkan nilai SDP adalah 51,52% untuk POT setelah pajak 1,8 tahun (maksimmum 5 tahun). kita mendapatkan nilai Internal Rate of Return (IRR) = 19,35% Jadi jika pabrik ini akan membangun begitu banyak keuntungan dan sangat menguntungkan

Kata kunci: Gypsum, kalsium sulfat dihidrat, $CaSO_4.2H_2O$

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STATEMENT OF AUTHENTICITY

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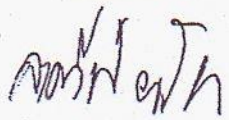
State the fact that final project results that I make and submit this is the result of my own work except for quotation and summaries that everything. I have explained the sources. If the final project is plagiarism and other scientific or research work, then I am ready to accept the sanction both academically and law.

Surakarta, 23 September 2017

Author



Lateefee Yangok

MOTTO

"Successful indeed are the believers, those who offer their Salat (prayers) with all solemnity and full submissiveness"

[Quran: surat Al-Muminoon, verses 1-2]

"Try not to become a man of success, but rather try to become a man of value"

DEDICATION

I dedicate this work to:

My beloved mother and father. Thank you for your prayer, support, love, and education you've given.

My beloved sister who always gives support, and advice.

My future Faeelah Deemae who always gives support, inspiration and spirit.

All of my friends are ready for help me.

All of my classmate in the International class 2011 who gave me comfort when learning.

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Bismillahirrohmanirrohim

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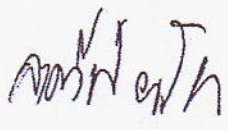
4. Eni Budiyati, S.T., M. Eng as second supervisor of final project
5. Rois Fatoni, ST, MSc. PhD as head of Chemical Engineering
6. Everyone who has supported the author to carry out this work placement very well.

Author wish this report to be beneficial to those my concern.

Wabillahittaufiq wal hidayah

Wassalamu'alaikum warrohmatullohi wabarokatuh

Surakarta, 23 September 2017



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